Nature Conservation

Nature Conservation 62: 337–354 (2026)
DOI: 10.3897/natureconservation.62.148845

Review Article

Does the Common Agricultural Policy 2023–2027 support the restoration of freshwater ecosystems?

Josselin Rouillard[1], Johanna Meier[1], Kirsty L. Blackstock[2], Keith B. Matthews[2], Sebastian Birk[3]

1 *Ecologic Institute, Berlin, Germany*
2 *The James Hutton Institute, Aberdeen, UK*
3 *University of Duisburg-Essen, Essen, Germany*

Corresponding author: Josselin Rouillard (josselin.rouillard@ecologic.eu)

OPEN ACCESS

Academic editor: Katrina Marsden
Received: 13 February 2025
Accepted: 3 July 2025
Published: 25 February 2026

ZooBank: https://zoobank.org/F95BB6E8-8028-4002-8430-D14C8B1A4971

Citation: Rouillard J, Meier J, Blackstock KL, Matthews KB, Birk S (2026) Does the Common Agricultural Policy 2023–2027 support the restoration of freshwater ecosystems? In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 337–354. https://doi.org/10.3897/natureconservation.62.148845

Copyright: © Josselin Rouillard et al.
This is an open access article distributed under terms of the Creative Commons Attribution License (Attribution 4.0 International – CC BY 4.0).

Abstract

The Common Agricultural Policy (CAP) is a key lever to support the transition towards sustainable agricultural production in Europe. However, successive reforms have been incremental and modest with regard to environmental objectives. This contribution presents an assessment of the choices made by Member States in their CAP Strategic Plans (CSPs), directing the EUR 307 billion in funding to support agriculture and rural areas for the period 2023–2027. The focus is on the different funding instruments supporting the restoration of freshwater ecosystems, in particular addressing the impact of drainage, restoring wetland and floodplain connectivity, and increasing landscape-scale water retention. A detailed mapping of farm practices supported by CAP funding – i.e. conditionality, eco-schemes, rural development (Environment and Climate measures), and investments – is presented. Results show that interventions to reduce the impact of drainage, restore wetland and floodplain connectivity, and increase landscape-scale water retention remain limited in scope. Illustrative examples of good practice are highlighted, along with recommendations for improved implementation of the CAP in the current programming period and the next round of reform.

Highlights

- CAP 2023–2027 offers opportunities for wetland and freshwater ecosystem restoration.
- Member State choices show limited ambition and do not fully exploit the potential of the CAP to support restoration efforts.
- Good practices where the CAP supports wetland and freshwater ecosystem restoration are identified.
- Better metrics and performance-based incentives are needed to improve outcomes.

Key words: Common Agricultural Policy (CAP), farmers, policy, rural development

Introduction

Despite a comprehensive EU policy framework to protect freshwater ecosystems (EC 2019; Klusmann et al. 2026), freshwater habitats such as rivers, lakes, wetlands and species are not improving. Less than 40% of surface waters in

Europe are classified as being in good or high ecological status, and the overall ecological situation has been stagnant since 2009 (EEA 2024). Pressures on hydromorphology – i.e. the physical characteristics, structure, and processes of water bodies – significantly impact 51% of European surface waters (EEA 2024). These pressures, primarily driven by agriculture, flood protection, energy generation, and navigation, put these water bodies at risk of failing to achieve good ecological status under the Water Framework Directive (WFD).

Agriculture tends to be the largest land use adjacent to freshwater ecosystems (wetlands, peatlands, streams, rivers, and floodplains), impacting water bodies through land improvement, i.e. drainage of wetlands and peatlands, dredging of watercourses, and structures for irrigation such as weirs, dams, and reservoirs (EEA 2019, 2021; Kaden et al. 2026). Through land management practices, it also more broadly affects landscape-scale water retention. The pressures from the agricultural sector on freshwater ecosystems show little sign of abatement (EEA 2021, 2024).

To counter these trends, there is a need to promote more sustainable agricultural practices that contribute to the conservation of water resources and the enhancement of ecosystem health (EEA 2021). This requires establishing positive incentives through policies and regulations, such as through the long-standing Common Agricultural Policy (CAP), which represents a major lever on agricultural practices in Europe. Successive reforms of the CAP have aimed to better integrate environmental objectives, including priorities for freshwater conservation. These reforms have made progress in addressing water management issues, though many limitations have been observed in previous programming periods (Dworak et al. 2009; ECA 2014; Berglund et al. 2017; EC 2017; Devot et al. 2020; ECA 2021).

The latest CAP reform has established a new 'Green Architecture' to advance the integration of environmental concerns. Compared to the 2014–2020 funding period, there is an increased focus on performance and results and a requirement to raise the overall environmental and climate ambition. Each Member State (MS) has designed a national CAP Strategic Plan (CSP), which presents an integrated strategy combining different funding instruments to achieve the policy's ten key objectives. These include nine Specific Objectives (SOs) – such as climate mitigation and adaptation (SO4), sustainable management of natural resources (SO5), and the protection of biodiversity and ecosystems (SO6) – and one additional cross-cutting objective. To meet these objectives, MS can select from a range of CAP interventions. While some interventions – such as eco-schemes and Environment and Climate interventions (ENVCLIM) – are compulsory to offer, MS retain considerable freedom in how they design their interventions.

In light of the EU's Green Deal biodiversity and climate ambitions for 2030 and 2050, including the new EU restoration law (EU 2024), the CAP must address the challenge of restoring aquatic ecosystems. For restoration managers, the CAP presents an opportunity, as pressures from land use and lack of funding are two of the main factors restricting restoration (Cortina-Segarra et al. 2021). By better understanding the structure and opportunities of the CAP, the restoration community can support farmers and land managers in accessing appropriate funding and achieving environmental outcomes. Hence, this paper evaluates the extent to which CSPs support the restoration of freshwater ecosystems. The analysis focuses on how MS designed their CSPs to address agricultural pressures on the natural features and hydrology of rivers and lakes, and the

physical restoration of freshwater habitats, including wetlands. Agricultural pollution is not addressed directly, but measures aiming to restore natural hydrological and morphological processes may also contribute to pollution reduction.

The evaluation is based on an extensive mapping of the MS CSPs, which provides an inventory of interventions, funded farming practices, financial allocations, and targets for implementation. All data were collected through the European Commission's (EC) publicly available Agri-food Data Portal. More detailed illustrations of good practice interventions are presented from selected CSPs. The remainder of this paper provides a discussion of the current Green Architecture of the CSP, followed by an analysis of each funding instrument. It then highlights both well-designed interventions and shortcomings, ending with recommendations for improving the implementation of the CAP.

The green architecture of the EU CAP 2023–2027

The Green Architecture describes the combination of CAP 'interventions' to deliver improvements with regard to climate, natural resources, and biodiversity objectives. The CAP relies significantly on four main interventions to deliver on its environmental and climate agenda: Conditionality, Eco-schemes, Environment and Climate (ENVCLIM) measures, and support for Investments (INVEST). Other relevant interventions, such as compensations for 'Areas of Specific Disadvantage' (ASD) due to obligations under the EU WFD and Natura 2000, and cross-cutting interventions such as knowledge exchange, cooperation, and innovation, can also contribute to environmental and climate objectives. However, they are seldom used or lack specific reference to water-related issues.

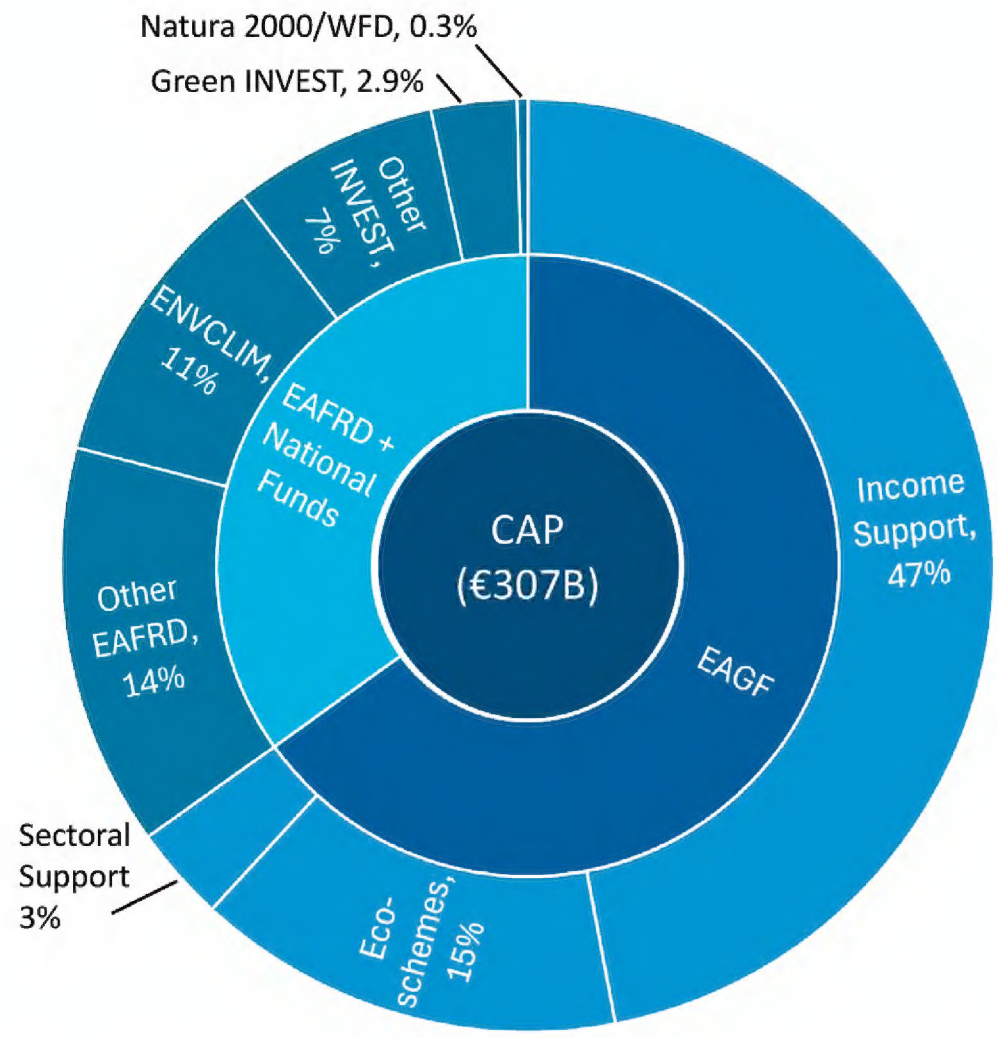

Figure 1. Green architecture of the CAP 2023–2027. Shares are over total CAP funding (EU and national funds) (source: own elaboration using data from EC (2022)). Notes: Figures refer exclusively to EU funding allocated within the 2023–2027 timeframe. Transnational arrangements, special funds, and non-EAGF or non-EAFRD measures are not included.

Fig. 1 displays the distribution of total public planned expenditure as per CAP 2023–2027 regulation.

Of the EUR 307 billion of total public expenditure for CAP 2023–2027 (EU and national sources, to be spent up to 2029), the majority is allocated to direct payments, funded under the European Agricultural Guarantee Fund (EAGF), followed by rural development, funded under the European Agricultural Fund for Rural Development (EAFRD) (EC 2023). Direct payments are further divided into several types of interventions, with most funds allocated to income support – such as Basic Income Support, Coupled Income Support, Compensatory Redistributive Income Support, and Complementary Income Support for Young Farmers, and Cotton – while the remainder goes to eco-schemes. Under rural development, the largest share is directed toward ENVCLIM, followed closely by INVEST. Payments for ASD receive a very small share.

The CAP regulations for 2023–2027 require minimum spending levels for green interventions. This includes at least 25% of direct payments under EAGF for eco-schemes and at least 35% of EAFRD for climate, environment, and animal welfare interventions (defined by the Commission to include ENVCLIM, 'green investments', ASD, and 50% of payments for Areas with Natural Constraints). This requirement was set at the national level, although a lower allocation to eco-schemes under EAGF could be compensated for by a higher share for climate, environment, and animal welfare interventions under EAFRD. Depending on historical context and strategic decisions regarding the use of EAGF and EAFRD funds, MS either prioritised funding allocations to eco-schemes (e.g. CZ, EE, NL, SK) or to climate, environment, and animal welfare interventions under EAFRD (e.g. AT, HU, SI) (EC 2023). These choices may also reflect the different modalities of the two funds: EAGF offers fully EU-financed, annually paid eco-schemes with simpler administration, while EAFRD involves co-financing, multi-annual planning, and more complex procedures but allows for more targeted and innovative interventions.

Current tools and interfaces provided by the EC do not allow direct calculation of the financial allocation to freshwater restoration. However, other figures are available to give an indication of scale. As indicated by data from the Agri-Food Data Portal on the financial allocation to CAP-specific objectives, approximately 29% of the annual CAP budget – equivalent to EUR 89 billion – is allocated to interventions contributing to SO5, which focuses on natural resources, including water, soil, and air. Of this amount, EUR 2 billion is exclusively dedicated to measures targeting this objective, i.e. this figure excludes direct payments except those with an explicit environmental purpose, i.e. eco-schemes. To assess the allocation of funds to water-related objectives, we analysed planned budgets for eco-schemes and ENVCLIM interventions using data from the Agri-Food Data Portal's catalogue of CAP interventions. For both intervention types, we aggregated the total planned expenditure and calculated the share of funding explicitly linked to Result Indicators (RIs) R21 (protecting water quality) and R23 (sustainable water use). Based on this analysis, we find that 35% of the eco-scheme budget and 66% of the ENVCLIM budget are linked to area-based payments contributing to improved water quality and going beyond conditionality (i.e. linked to R21). Allocation is significantly lower for water balance measures addressing water scarcity and droughts (i.e. linked to R23), with 14% of the eco-scheme budget and 8% of the ENVCLIM budget for this topic. Furthermore, 21% of Utilised Agricultural Area (UAA) is targeted by interventions improving water quality (linked to R21)

(EC 2022). This can be compared to 47% of UAA targeted to improve soil quality (EC 2022), which has a more direct benefit for agricultural production.

It is overall difficult to compare budgets between MS due to differences in how eco-schemes and ENVCLIM interventions are allocated to specific environmental targets. However, using targets set under their RIs linked to specific environmental and climate topics, we can observe that all MS have planned area-based payments for water quality, while only eleven MS have planned such payments for improving water balances (EC 2023). There are surprising omissions. For instance, Spain has not planned any area-based payments for improving water balance measures. Thus, despite emerging water resilience concerns (EEA 2024), there are limited mechanisms being used to address water balance issues, at least through area-based compensation measures.

River and wetland restoration evident in CSPs

This section presents each type of CAP intervention and how they incentivise farmers to adopt farm practices that contribute to protecting or restoring freshwater ecosystems. This analysis is based on a recently published mapping of farming practices in CSPs (EC 2024), using a typology of farm practices established by Angileri et al. (2024). Table 1 presents the list of farming practices selected for analysis based on interventions contributing to the restoration of natural hydrology and morphology of rivers, lakes, and wetlands, including those that help protect and restore riparian areas and wetlands, as well as reduce runoff and increase water retention in the wider agricultural landscape (see also OIEAU 2024).

Conditionality

Conditionality rules are legal standards from existing environmental legislation ('Statutory Management Requirements' (SMR)), and nine additional standards set out under CAP regulations that define 'Good Agricultural and Environmental Condition' (GAEC). Conditionality plays an important role in environmental mainstreaming, as the instrument applies to all agricultural area-based payments, i.e. payments provided per hectare of land, such as income support for farmers. According to a recent analysis, conditionality applies to 89% of the EU's UAA (EC 2023) used for farming practices. SMRs focus mainly on addressing agricultural pollution, but several GAECs have the potential to contribute to river and wetland restoration.

At the EU level, the new GAEC 2 requires each MS to ensure appropriate protection of wetlands and peatlands by 2025, primarily to preserve their carbon potential (using landscape and soil management farm practices). There is no obligation to halt or reverse degradation, and the requirements are not clearly defined, leaving much flexibility to MS.

GAEC 4 requires a minimum of 3 m buffer strips (see water and landscape practices), within which a ban on the use of fertilisers and pesticides is implemented. As such, GAEC 4 primarily benefits water quality. Nevertheless, according to EC (2023), ten MS also included bans or restrictions on tillage and ploughing, and maintenance of vegetative cover. These measures increase the effectiveness of buffer strips by preserving riverbanks and reducing soil erosion.

Table 1. Potential of farm practices to support freshwater restoration.

Farm practice (Section)*	Farm practice*	Benefits for river and wetland restoration
Water	Bans or restrictions on ploughing, grazing, or mowing along watercourses	Preservation of riverbanks from animal trampling and damage from nearby cultivation practices; preservation of rivers from sediment erosion input from nearby fields
	Temporary storage of floodwater on agricultural fields	Retention and percolation of floodwater into the alluvial aquifer (commonly used as a flood management measure)
	Drainage ban/restriction	Reduction of water runoff and increase of water retention on agricultural land
Landscape	Hedgerows/individual or group of trees/trees in line	Reduction of water runoff and soil erosion on agricultural land and increase of water retention (and pollutants) in the agricultural landscape, thereby indirectly contributing to a more natural flow of water
	Field margins, patches, and unproductive buffer strips along watercourses	
	Ponds	
	Small wetlands	
	Streams	
	Agroforestry	
	Management of wetland/peatland	
Crop rotation & diversification	Land lying fallow	
Soil management	Tillage	Increase of surface roughness and soil organic carbon, thereby reducing rainfall runoff and favouring landscape water retention
	Soil cover	
Grazing and grassland management	Rotational resting of grassland	Reduction of overland runoff and storage of water (as compared to arable land), with most benefit arising from permanent grassland
	Ban on ploughing of grassland	
	Conversion of arable land to grassland	

*As defined by Angileri et al. (2024).

GAEC 8 requires the retention of landscape features on agricultural land. When features are strategically positioned – such as on slopes or in riparian areas – they create space for water and can act as barriers to runoff, leading to higher infiltration and increased water retention in soils and groundwater. MS are free to choose which landscape features are eligible. Typical landscape features included in GAEC 8 are buffer strips, field margins, hedgerows, and land lying fallow. Freshwater habitats like small ponds, streams, and small wetlands are eligible, yet are rarely included.

Other GAECs also contribute to restoring a natural flow across the landscape by protecting soils in arable areas (i.e. GAEC 5 sets restrictions on tillage; GAEC 6 requires minimum soil cover during sensitive periods; and GAEC 7 requires minimum crop rotation and diversification) and by protecting permanent grasslands (i.e. GAEC 1 and 9). By preserving soil health, they can enhance soil organic carbon and its capacity to absorb and retain rainwater.

Overall, the effectiveness of conditionality has been weakened by several provisions in the CAP regulations – for example, delays in the implementation of some GAECs (e.g. GAEC 2), ambiguities in the definition of GAECs (e.g. what is considered a watercourse under GAEC 2; see EC (2023)), and the use of exemptions for certain farms (applicable under GAEC 7 and 8). For example, in the approved CSPs in 2023, all MS exempted small farms below 10 ha from meeting

the requirements of GAEC 7. This represents 76% of farms in the EU, covering around 26% of arable land (EC 2023). Furthermore, two sets of 'simplification' packages amending the CAP regulations were adopted in April 2024 and May 2025 in response to widespread farmer protests in various MS and broader concerns, including administrative burden and food security pressures, particularly in the context of geopolitical instability following Russia's invasion of Ukraine. These amendments further weakened conditionality by allowing MS to:

- Remove GAEC 2 from conditionality so that farmers can receive eco-scheme payments for preserving wetlands and peatlands;
- Align, under GAEC 4, the definition of watercourses with national legislation, even when those definitions do not include smaller but ecologically important watercourses;
- Remove the obligation to maintain a minimum share of landscape features on arable land under GAEC 8, and offer as an alternative an equivalent eco-scheme;
- Extend, under GAEC 1, the number of years that grassland is considered permanent from 5 to 7 years, and increase the allowable reduction in permanent grassland before triggering reconversion requirements from 5% to 10%;
- Add various exemptions to GAEC 5, 6, and 7.

MS changes to their conditionality requirements are therefore ongoing.

Eco-schemes

Eco-schemes are area-based payments to incentivise environmental farming practices that go beyond conditionality requirements. Unlike other direct payments, which are based on the cultivated area under production, eco-scheme payments account for the entire agricultural area, including non-productive elements such as landscape features. Fig. 2 presents the farming practices (see Table 1) that are supported by eco-schemes.

To analyse the uptake of relevant farm practices across intervention types in the CSPs, for this and the subsequent figures, we used the farm practice dataset from the catalogue of CAP interventions. This dataset was filtered to include only entries referring to the intervention types and farm practices identified as relevant, i.e. eco-schemes, ENVCLIM, and INVEST interventions, and farm practices as displayed in Table 1. We then aggregated the data to determine, for each relevant farm practice, the number of MS whose CSPs include at least one intervention supporting that practice.

The figure illustrates that soil management practices are most frequently supported under eco-schemes, followed by support to certain landscape features, crop rotation and diversification, and grassland management. Water-specific practices receive the least support. These practices are similar to those supported through conditionality, though eco-schemes must go beyond in terms of ambition and requirements. These include soil management practices such as soil cover and tillage restrictions. For instance, Belgium Flanders' eco-scheme 'cultivation techniques for anti-erosion and soil improvement' goes beyond GAEC 5 and 6, encouraging actions such as strip-till and direct sowing to enhance soil cover, which improves soil structure and water retention. Another example is Luxembourg's 'installation

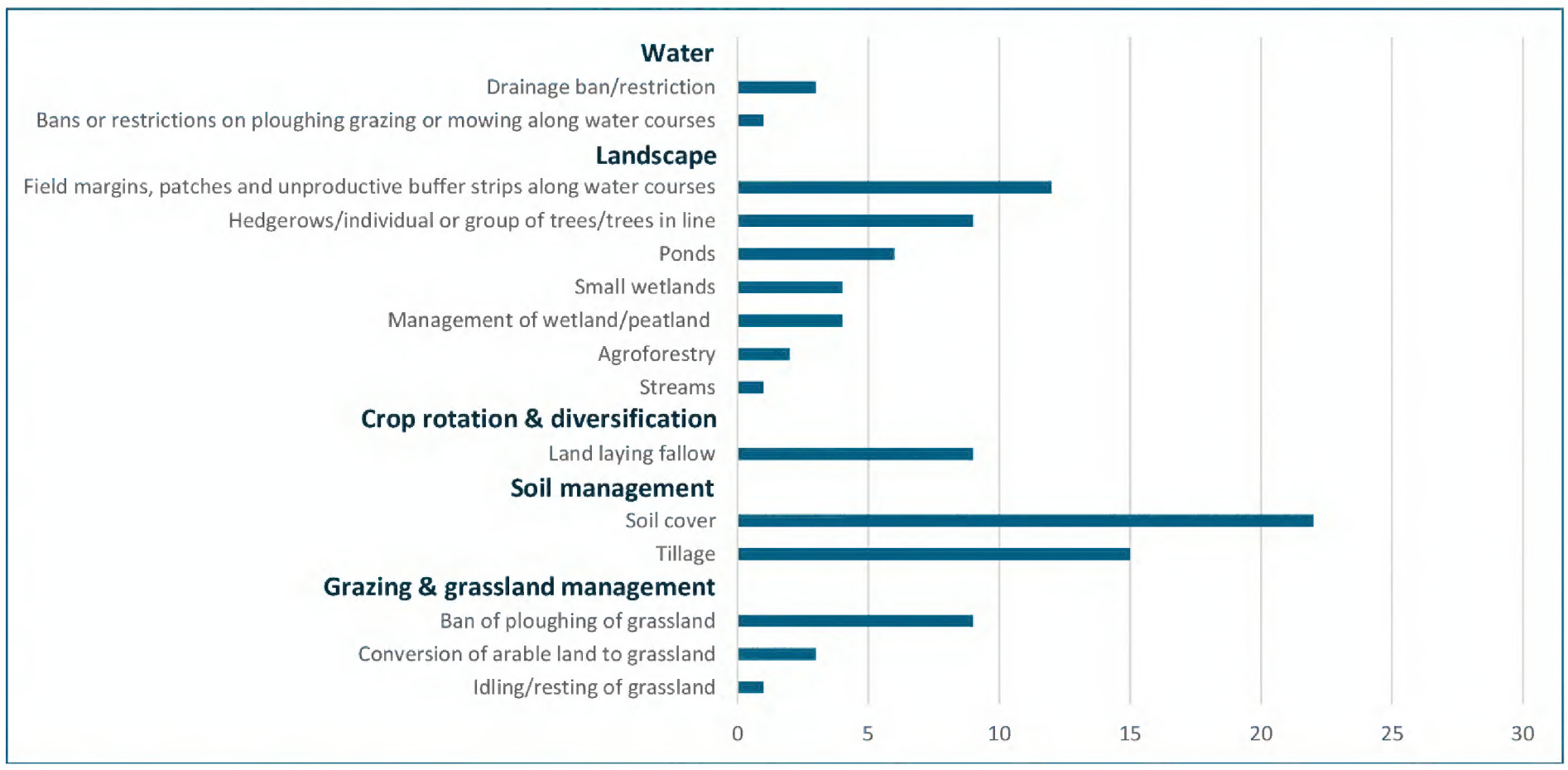

Figure 2. Number of CSPs that support a specific farm practice detailed in Table 1 via at least one eco-scheme intervention. Note: the figure displays only those farming practices that are supported in at least one CSP.

Box 1. A Polish eco-scheme on 'Water retention on permanent grassland' (I 4.5).

This eco-scheme aims to enhance water retention, improve water management, and reduce carbon emissions by slowing organic matter decomposition. The intervention targets meadows and pastures within Natura 2000 sites, water-related habitats such as wetlands, and areas pre-designated for their water retention functions, particularly those with extensive or ecological production systems. With a total public expenditure of EUR 97.3 million between 2023 and 2029, it accounts for 2.24% of Poland's total eco-scheme budget, targeting annually a maximum of 315 thousand hectares for a payment of 62 EUR per hectare. Eligible beneficiaries include active farmers with holdings of at least 1 hectare or smaller holdings meeting specific criteria.

of non-productive bands', which goes beyond GAEC 4 by supporting more extensive buffer strips along rivers and other critical areas susceptible to erosion. Box 1 further presents an eco-scheme that complements GAECs 1 and 9, protecting permanent grassland, with the specific purpose of enhancing water retention.

Relatively few MS have designed eco-schemes supporting other relevant practices, such as the management of wetlands and peatland, agroforestry, and restrictions or bans on drainage. This picture may change due to the revisions of GAEC 8, leading to greater uptake of landscape features being compensated by eco-schemes. Nevertheless, a good example of support for landscape features is Lithuania's 'maintenance of landscape features', which supports the creation and maintenance of landscape features, including water bodies such as ponds and lakes. Germany's 'maintaining agroforestry practices on arable land and permanent grassland', on the other hand, supports woody strips of trees and shrubs in agricultural landscapes, which aim to reduce water runoff and erosion, and improve water retention.

ENVCLIM interventions

As with eco-schemes, ENVCLIM interventions are area-based payments to incentivise the uptake of environmental farm practices. However, ENVCLIM tend to be more targeted than eco-schemes and are undertaken as multi-annual

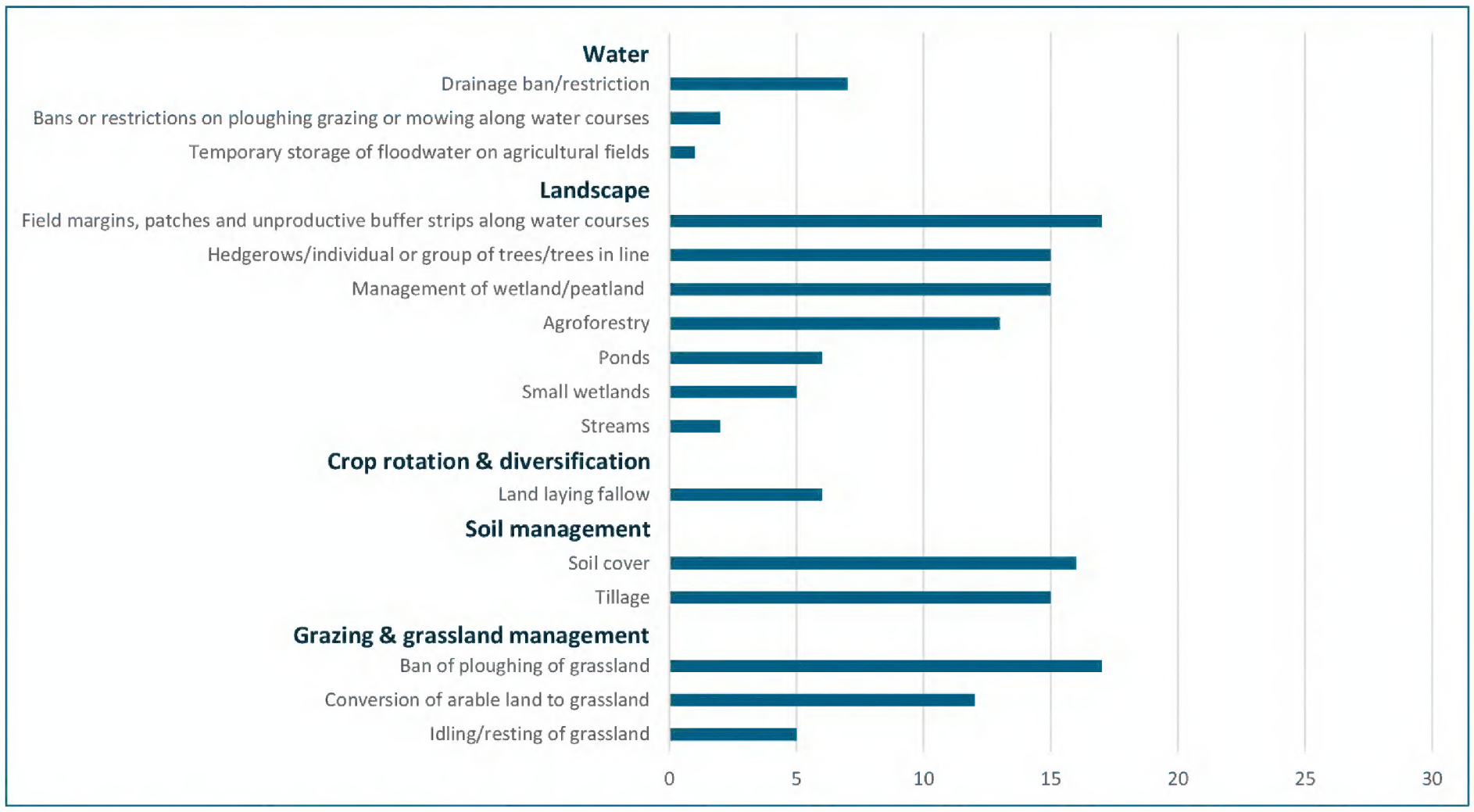

Figure 3. Number of CSPs that support a specific farm practice via at least one ENVCLIM intervention. Note: the figure displays only those farming practices that are supported in at least one CSP.

commitments of five to seven years, whereas eco-schemes are annual payments (EC 2023).

Fig. 3 presents the number of CSPs with at least one ENVCLIM intervention supporting the respective practice. Overall, MS frequently support practices to improve soil management through soil cover and tillage restrictions. Unlike eco-schemes, a majority of MS have also adopted ENVCLIM interventions that protect and restore landscape features (e.g. through buffer strips, hedgerows, and groups of trees) and land use restrictions, for instance, bans on ploughing of grassland and support for the conversion of arable land into grassland.

The difference in the design of the eco-scheme and the ENVCLIM intervention lies in the level of ambition. The German ENVCLIM intervention 'management commitments to improve climate protection', for instance, promotes land use change through, e.g. the conversion of arable land to permanent grassland and rewetting of peatlands. In contrast, eco-schemes primarily focus on land management, such as changing soil cover, restricting certain tillage practices, and protecting and maintaining maintenance of existing landscape features. Similarly, the German ENVCLIM intervention 'management of water quality' supports the creation of buffer strips and other water-sensitive areas, while eco-schemes ensure their ongoing management and maintenance.

Several CSPs offer ENVCLIM to manage wetlands and peatlands. For instance, the Swedish 'compensation for the management of wetlands and ponds' aims to prevent wetlands and ponds from becoming overgrown or losing functionality, while enhancing their role in flow regulation, water quality improvement, and biodiversity enhancement. The measures should maintain and contribute to the functionality of wetlands.

Some MS support drainage bans or restrictions. Finland's 'management of run-off waters' focuses on regulating drainage systems to control runoff, re-

duce nutrient leaching, and prevent soil erosion, while also managing the water needs of crops to keep groundwater levels as high as possible outside of active cultivation periods. Moreover, in some cases, drainage water is recycled by storing it in reservoirs during wet periods and reusing it for irrigation during dry spells. A unique example of a result-based ENVCLIM intervention integrating the issue of drainage exists in Ireland (Box 2).

Box 2. The Irish ENVCLIM intervention 'Agri-environment climate measure "AECM" – cooperation option'.

The intervention, known as the Agri-Climate Rural Environment Scheme ('ACRES') Cooperation, is designed as a hybrid model that combines both fixed and result-based payments, rewarding farmers based on the quality of their environmental outcomes. A scoring system evaluates environmental indicators, with payments tied to scores above a certain threshold. Although the main criteria used to deliver payment are not water-related, hydrological integrity, i.e. drainage conditions, is still assessed and can impact scores. The intervention places significant emphasis on the management and restoration of commonages and degraded lands, including peatlands. It specifically targets high-priority areas, addressing environmental needs such as water and biodiversity through targeted, local action plans. Regional teams and trained advisers provide support and guidance to farmers, helping them achieve higher environmental scores. Farmers are required to submit a farm sustainability plan (FSP) based on the cooperation project action plan when applying for the scheme. To maximise farmers' activities linked to the Water Framework Directive and Natura 2000 sites, the scheme will support them in meeting requirements under these directives by designing whole-farm solutions.

For the period 2023–2029, the intervention has a total public expenditure of EUR 460 million, targeting 2 million hectares, and accounting for 26.17% of Ireland's total ENVCLIM budget. Eligible beneficiaries include active farmers in the defined high-priority areas.

Some CSPs also offer more specific support for paludiculture, i.e. the practice of cultivating crops on wet or rewetted peatlands to enable the productive use of restored peatlands. For instance, Latvia's 'environmentally friendly horticulture' targets sensitive environmental areas, including peatlands, and promotes environmentally sound management techniques that reduce reliance on plant protection products, enhance nutrient management, and mitigate environmental risks. The Spanish 'agri-environment commitments on agricultural areas' promotes non-chemical weed control in rice cultivation areas, as well as the creation of paludious vegetation areas alongside rice fields.

Investments

Investment interventions encompass a wide range of payments aimed at supporting capital expenditures. Most interventions in CSPs are productive investments, which aim to support technological progress and labour productivity in agriculture (EC 2023). In the freshwater domain, these include investments in the efficient use of water and other inputs such as nitrogen and pesticides.

With regard to freshwater restoration, the most relevant types of support are non-productive investments, either on-farm or off-farm. On-farm investments are targeted at farmers to support the capital costs of freshwater restoration on their farm. Off-farm investments can be useful for river and wetland restoration projects where a separate organisation (non-farmer) may implement the restoration. Investments are particularly relevant for creating landscape features such as constructed wetlands and for projects with large capital costs, such as river remeandering. Based on data on planned outputs from the Agri-Food Data Portal, 24 MS have at least one non-productive on-farm investment

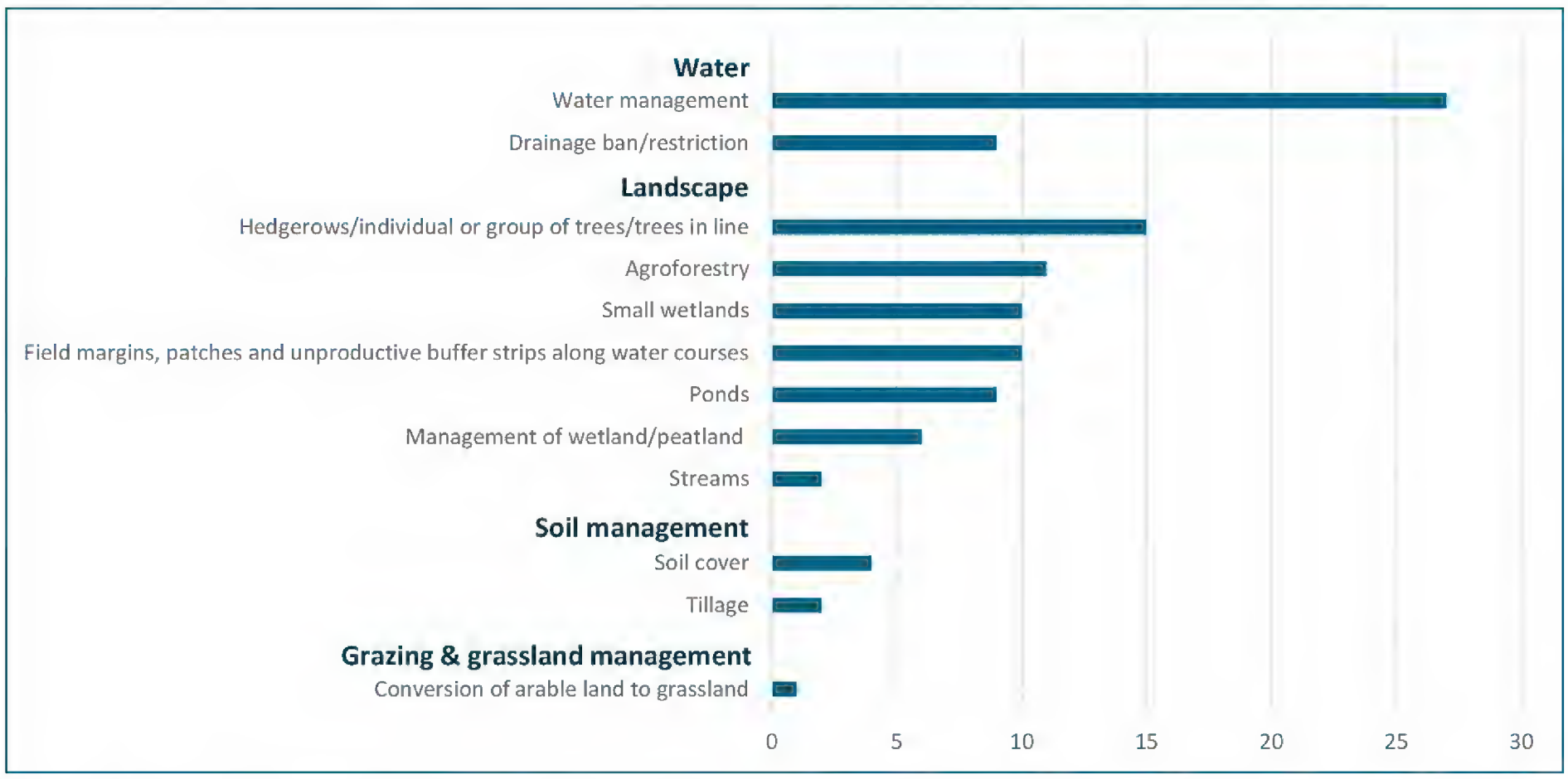

Figure 4. Number of CSPs that support a specific farm practice via at least one investment intervention. Note: the figure displays only those farming practices that are supported in at least one CSP.

intervention, while 22 MS include at least one non-productive off-farm investment intervention in their CSP.

Green investments refer to all investment interventions (productive and non-productive, on-farm and off-farm) that contribute to climate and environmental goals, i.e. contributing to RIs 15, 16, 17, 26, and 27 (EC 2023). Based on available data on planned outputs, they represent 62% of INVEST interventions, with a total public expenditure of EUR 28 billion for the period 2023–2029. The majority of investment support is targeted at productive investment, with non-productive investment interventions (on- and off-farm) specifically linked to environment and climate goals representing EUR 17 billion, or approximately 30% of the financial allocation to investment interventions.

Fig. 4 presents the farming practices that are supported by investments. Overall, 27 CSPs have investment interventions that include water management, and 24 CSPs have planned to support investments into the creation of at least one type of water-relevant landscape feature. Many of the investments in water management take a technical efficiency approach by investing in equipment to improve the efficient use of fertilisers, pesticides, and irrigation water, with less investment directly supporting freshwater habitat restoration.

According to the Commission (EC 2023), some countries stand out with regard to non-productive investments for restoring freshwater ecosystems. For instance, the Netherlands dedicates a large portion of its EAFRD budget to 110 projects focused on managing unproductive areas and landscape features, and improving water efficiency, with a particular emphasis on floodplain restoration. Denmark, Austria, and Finland also make significant investments in wetland restoration and flood retention areas to mitigate flood risks. Another example is Belgium's aid for non-productive investments (Box 3).

Nearly a third of MS have INVEST support for small wetlands, drainage restrictions or bans, and the management of wetlands and peatlands. For instance, the Slovakian 'building common facilities and measures – elements

Box 3. Belgium Wallonia's 'Aid for non-productive investments in agricultural holdings' and 'Aid for non-productive investments in rural areas'.

Belgium Wallonia's CSP entails two investment interventions that provide a complementary, comprehensive approach to support water retention, land hydrology restoration, wetland and peatland preservation, and freshwater habitat restoration.

The 'Aid for non-productive investments in agricultural holdings' supports structural changes on agricultural land to reduce soil erosion and manage water runoff and aquifer recharge by slowing water flow and promoting infiltration. For 2023–2029, the intervention allocates a total public expenditure of EUR 900,000 and targets 225 separate investments. Beneficiaries for this intervention are farmers (or groups of farmers).

The 'Aid for non-productive investments in rural areas' focuses on restoring natural ecosystems such as wetlands and peatlands, explicitly prioritising areas of high ecological value, such as Natura 2000 sites, where there is a need for habitat restoration and biodiversity conservation. The intervention allocates a budget of EUR 11.3 million and targets 314 separate investments for the period 2023–2029. Beneficiaries are private or public landowners and managers.

of green and blue infrastructure' investment aims to protect soil from erosion, improve water management, and boost biodiversity. It supports anti-erosion measures like afforestation, windbreaks, and terraces, as well as water management structures such as reservoirs and flood control systems. It explicitly prioritises projects that involve natural landscape features that help reduce flood risks and create habitat.

Discussion

To mainstream restoration in farming practice, incentives for restoration must be available, targeted to the right locations, and taken up by land managers. Therefore, understanding the opportunities offered by the CAP 2023–2027, with its renewed focus on enhancing environmental and climate-related objectives through the 'Green Architecture' (Fig. 1), is important for freshwater restoration.

The reform opened up significant opportunities to improve freshwater habitats, wetlands, and broader biodiversity goals. Relevant conditionality requirements were strengthened, such as GAEC 4 (buffer strips along watercourses), while others were added to better protect wetlands and peatlands (i.e. GAEC 2). Funding broad interventions such as eco-schemes from the EAGF, with the potential to reach a high number of farmers, creates potential leveraging and/or pull effects and recasts environmental measures as part of conventional farming practice. These are complemented by targeted, funded ENVCLIM or INVEST interventions. Very few MS programmed ASD, and while cooperation and knowledge exchange are programmed, they are rarely designed specifically for water management.

In terms of farm practices supported by the CSPs, the most frequently relevant measure supported through eco-schemes and ENVCLIM is improved soil management. While contributing to restoring natural hydrological processes at the landscape scale, this measure primarily aims to protect long-term farm productivity. Despite some good practices in CSPs, very few MS have planned to support specifically the restoration of wetlands and peatlands or to compensate for restrictions and bans on drainage.

Moreover, some payments not only fail to reward environmental improvements but can incentivise harmful practices – such as continued drainage of wetlands or water-intensive practices – that directly undermine freshwater restoration goals. According to our analysis, investments appear more frequently allocated to grey water infrastructure, such as improved irrigation efficiency and

reservoirs, than to non-productive investments in landscape restoration and natural water retention. Recognising the potential negative impact of investing in grey infrastructure on freshwater ecosystems, the CAP Regulation (Articles 73 and 74) has specified several environmental requirements for investment decisions, such as those in irrigation schemes, reservoirs, and reclaimed water. However, these may not be sufficient to prevent damage from infrastructure investments (Vandermaesen et al. 2024). Other investments with possible negative externalities on freshwater ecosystems include support to create or restore drainage schemes; such interventions are included in at least 11 CSPs, according to our review. A stronger focus on sustainable investments, training, and environmental services to help farmers embrace regenerative farming that delivers landscape-scale outcomes is needed, rather than maintaining compensatory payments (Baldock and Bradley 2023; SDFA 2024).

One major challenge is the weak or inconsistent implementation of conditionality across MS. In particular, many MS delayed implementation of GAEC 2, which is intended to protect peatlands and wetlands, as permitted under the CAP regulation. In other relevant GAECs (e.g. GAEC 7, 8), exemptions are used widely, especially on small farms, leading to a large share of EU agricultural land not being required to meet certain relevant requirements. Moreover, most GAECs have now been weakened through two rounds of simplification packages, further diminishing their potential impact. Reinforcing these GAECs is crucial to ensure that area-based payments can effectively support the restoration of freshwater ecosystems, as mandatory baseline requirements ensure consistent and widespread implementation – something that voluntary interventions do not reliably achieve. The uptake of farm practices through voluntary interventions is dependent on the level of funds and payments provided to compensate for the adopted practices. Evidence suggests that the removal of the requirement to maintain a share of unproductive land under GAEC 8 was not accompanied by eco-schemes offering sufficient incentive to achieve wide uptake (Matthews 2024).

More broadly, recent reviews suggest that several MS have tended to opt for less ambitious, poorly targeted annual eco-schemes (Nadeu and Godfroy 2024), and the implementation of ENVCLIM is generally not prioritised in areas that would contribute to the restoration of freshwater ecosystems (EC 2023). Evidence also suggests that the creation of eco-schemes under the EAGF, in addition to ENVCLIM under the EAFRD, has complicated the delivery of payments and interactions between the two main CAP funds (EU CAP Network 2024).

Environmental payments are currently calculated based on income foregone and additional costs, rather than rewarding the adoption of sustainable practices and the delivery of ecosystem services. As a result, the levers to drive meaningful biodiversity and water protection outcomes are limited. A shift towards more targeted or result-based interventions and payments could help address these shortcomings. For instance, by linking payments directly to measurable environmental outcomes – such as the degree to which the practices adopted reduce drainage or the risk of soil erosion or nutrient leaching – result-based approaches can ensure that farmers are incentivised to adopt more ambitious practices.

The more ambitious environmental interventions, for instance among ENVCLIM, have insufficient monitoring and evaluation frameworks and are characterised by unclear objectives, a focus on outputs over outcomes, and inconsistent or missing links between results indicators and specific objectives (ECA 2024).

The lack of indicators to measure spending or performance of interventions related to freshwater habitats is problematic. Performance metrics are essential to reward both environmental sustainability and farmers' economic viability and to direct incentives to where they can achieve the CAP strategic objectives.

From a budgetary perspective, CAP funding remains largely income- and compensation-based rather than performance-based, i.e. most funding continues to flow to direct or other forms of income support, despite overwhelming evidence that these payments are inefficient in relation to income and may act as a barrier to the uptake of sustainable farm practices and other CAP objectives (Baldock and Bradley 2023). Less than 25% of the EAGF is directed towards eco-schemes and therefore earmarked to enhance the environmental performance of farms.

Ongoing reforms in the United Kingdom provide some insights into alternative financing models for agriculture, showing ambition in reducing or removing direct income support and increasing the opportunities for collaborative approaches to freshwater restoration. Likewise, the UK can learn from the challenges of translating the ambition of the CAP into the uptake of new farming practices that are accepted and implemented (Box 4).

Box 4. Current agricultural reforms in the United Kingdom.

Since leaving the EU, the UK no longer follows the CAP, giving it the opportunity to develop its own agricultural policies. This is taking shape as a shift away from direct payments to farmers to payments tied to the delivery of public goods (ecosystem services). This shift presents a balancing act between transforming the agricultural system and managing a smooth transition from the CAP.

In England, the 'Environment Land Management Programme' is set to replace direct payments by 2027, promoting sustainable land management, prioritising local habitats and species, and supporting long-term, large-scale interventions (via land recovery schemes). New regulations from 2024 include measures to prevent soil erosion and water pollution, with added support for restoring water bodies and peatlands.

Phasing out direct payments between 2025 and 2029, Wales is following suit with a 'Sustainable Farming Scheme' that includes support for mandatory and voluntary individual and collaborative actions (via the Integrated Natural Resources Scheme). It includes mandatory wetland management, with additional optional and collaborative actions for water conservation.

Scotland's new Agriculture and Rural Communities Act (2024) will add conditionality to existing direct payments, requiring agri-environmental management, complemented by access to elective and capital payments to deliver restoration or transformation. The reforms support water-related measures such as wetland and riparian feature management, but currently the funding for large-scale restoration remains unclear (see route map).

Conclusion

The CAP is the EU's primary funding instrument influencing land and water management at scale and holds significant potential to improve freshwater habitats and biodiversity. The latest 2023–2027 reform, as part of a long 'greening' process that started in the 1990s, reflects a growing commitment to integrating environmental and climate objectives into agricultural policy. It introduces several instruments to incentivise farmers and land managers to deliver environmental improvements. Several MS have designed promising interventions, showcasing that the CAP can enable meaningful action when harnessed with strategic focus and ambition.

While these developments are encouraging, the potential of the CAP is not fully realised. The flexibility granted to MS in designing their CSPs allows them to prioritise political feasibility and farmer participation over environmental am-

bition. As a result, many CSPs do not sufficiently support freshwater ecosystem restoration, with 1) inconsistent application of conditionality that mostly stays at the minimum regulatory level set by the EU and is currently being further weakened; 2) eco-schemes and ENVCLIM interventions with limited ambition and targeting for freshwater restoration; 3) INVEST interventions still mostly targeted to grey infrastructures rather than ecosystem restoration investments; and 4) a majority of CAP funding still directed towards income support that can maintain the status quo, rather than being actively supporting sustainable, long-term farm practices with clear environmental outcomes.

To harness the full potential of the CAP for environmental improvements in general and freshwater restoration in particular, further policy refinements are required. First, implementation of conditionality must be consistent and enforceable, especially where linked to key habitats such as watercourses, wetlands, and peatlands. Second, eco-schemes and ENVCLIM interventions should be better targeted to areas where they can have the greatest environmental impact and be backed by robust monitoring systems. Third, the CAP should shift more decisively towards performance-based payments that reward outcomes rather than compensate for income foregone. Fourth, greater use of the full suite of intervention types available to MS should be made (e.g. non-productive investments, ASD, sectoral support, knowledge exchange, and cooperation). Finally, phasing out harmful subsidies and redirecting investments toward nature-based solutions and farmer capacity building will be essential.

As the next EU budgetary cycle approaches (2028–2034) and the impacts of climate change become increasingly evident on agriculture and the natural resources on which agriculture depends on (e.g. soils, water, and biodiversity), continuing 'business as usual' is not an option. There needs to be a joined-up approach to tackle the multiple environmental crises (water, climate, etc.) alongside the social and economic challenges the agricultural sector is facing so that restoration is seen as a practical and attractive opportunity.

Additional information

Conflict of interest

The authors have declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Use of AI

No use of AI was reported.

Funding

The authors acknowledge funding from the European Union's Horizon 2020 research and innovation programme for the MERLIN project under grant agreement No. 101036337. Additional funding was provided by the Scottish Government's Rural and Environment Science and Analytical Services Division through grant KJHI-C3.1.

Author contributions

All authors have contributed equally.

Author ORCIDs

Josselin Rouillard https://orcid.org/0000-0002-1070-5325
Johanna Meier https://orcid.org/0000-0002-2569-4294
Kirsty L. Blackstock https://orcid.org/0000-0002-0429-0215
Keith B. Matthews https://orcid.org/0000-0001-8472-8872
Sebastian Birk https://orcid.org/0000-0002-2597-8692

Data availability

All datasets used in this study are publicly available and cited in the main text. The processed data and analysis codes used in this study are available from the authors upon request.

References

Angileri V, Guerrero I, Weiss F (2024) A classification scheme based on farming practices – A tool for labelling interventions with environmental and climate related commitments in Common Agricultural Policy strategic plans. Publications Office of the European Union, Luxembourg. https://data.europa.eu/doi/10.2760/33560

Baldock D, Bradley H (2023) Transforming EU land use and the CAP: A post-2024 vision. Policy Paper. Institute for European Environmental Policy, Brussels. https://ieep.eu/publications/transforming-eu-land-use-and-the-cap-a-post-2024-vision/

Berglund M, Rouillard J, Dworak T (2017) Guidance on good practice RDP from a water perspective. Ecologic Institute and Fresh Thoughts, Berlin and Vienna, UC12447.01. https://www.ecologic.eu/14844

Cortina-Segarra J, García-Sánchez I, Grace M, Andrés P, Baker S, Bullock C, Decleer K, Dicks LV, Fisher JL, Frouz J, Klimkowska A, Kyriazopoulos AP, Moreno-Mateos D, Rodríguez-González PM, Sarkki S, Ventocilla JL (2021) Barriers to ecological restoration in Europe: Expert perspectives. Restoration Ecology 29(4): e13346. https://doi.org/10.1111/rec.13346

Devot A, Daydé C, Manzato L, de Pierrepont A, Bresson C, Lisbona D, Augier J, Menet L (2020) Evaluation of the impact of the CAP on water: Final report. Publications Office of the European Union, Luxembourg. https://doi.org/10.2762/63371

Dworak T, Berglund M, Liesbet V, Campling P, Kampa E, Ribeiro M, Thaler T (2009) WFD and agriculture linkages at the EU level. Summary report on an in-depth assessment of RD-programmes 2007–2013 as regards water management. Ecologic Institute and VITO.

EC [European Commission] (2017) Commission Staff Work Document: Agriculture and Sustainable Water Management in the EU. SWD (2017) 153 final. European Commission, Brussels. https://circabc.europa.eu/sd/a/abff972e-203a-4b4e-b42e-a0f291d3fdf9/SWD_2017_EN_V4_P1_885057.pdf

EC [European Commission] (2019) Commission Staff Working Document: Fitness Check of the Water Framework Directive, Groundwater Directive, Environmental Quality Standards Directive and Floods Directive. SWD (2019) 439 final. European Commission, Brussels. https://commission.europa.eu/system/files/2020-04/swd_2019_0439_en.pdf

EC [European Commission] (2022) Common Agricultural Policy for 2023–2027. 28 CAP Strategic Plans at a glance. European Commission, Brussels. https://agriculture.ec.europa.eu/system/files/2022-12/csp-at-a-glance-eu-countries_en.pdf

EC [European Commission] (2023) Mapping and analysis of CAP strategic plans: Assessment of joint efforts for 2023–2027. Publications Office of the European Union, Luxembourg. https://doi.org/10.2762/71556

EC [European Commission] (2024) Catalogue of CAP interventions. European Commission, Directorate-General for Agriculture and Rural Development, Brussels. https://agridata.ec.europa.eu/extensions/DashboardCapPlan/catalogue_interventions.html

ECA [European Court of Auditors] (2014) Integration of EU policy objectives with the CAP: A partial success. Special Report No 4/2014. Publications Office of the European Union, Luxembourg. https://doi.org/10.2865/15216

ECA [European Court of Auditors] (2017) Greening: A more complex income support scheme, not yet environmentally effective. No 21/2017. European Court of Auditors, Luxembourg. https://doi.org/10.2865/170434

ECA [European Court of Auditors] (2021) Sustainable water use in agriculture: CAP funds more likely to promote greater rather than more efficient water use. No 20/2021. Publications Office of the European Union, Luxembourg. https://doi.org/10.2865/497724

ECA [European Court of Auditors] (2024) Common Agricultural Plans – Greener, but not matching the EU"s ambitions for the climate and environment. No 20/2024. Publications Office of the European Union, Luxembourg. https://doi.org/10.2865/717118

EEA [European Environment Agency] (2019) Floodplains: A natural system to preserve and restore. EEA Report No 24/2019. Publications Office of the European Union, Luxembourg. https://doi.org/10.2800/431107

EEA [European Environment Agency] (2021) Water and agriculture: Towards sustainable solutions, EEA Report No 17/2020. Publications Office of the European Union, Luxembourg. https://doi.org/10.2800/73735

EEA [European Environment Agency] (2024) Europe's states of water: The need for improved water resilience, EEA report 07/2024. Publications Office of the European Union, Luxembourg. https://doi.org/10.2800/02236

EU (2024) Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU). OJ L, 2024/1991, 29.7.2024. https://eur-lex.europa.eu/eli/reg/2024/1991/oj/eng

EU CAP Network (2024) Thematic Group on Green Architecture: Designing Green Strategies. Thematic Group – 2nd Meeting, 4th June 2024 Brussels. https://eu-cap-network.ec.europa.eu/thematic-group-green-architecture-designing-green-strategies_en

Kaden US, Schmid S, Vieweg M, Scholz M, Dufour S (2026) European riverine and coastal wetlands under pressure: biodiversity and climate change. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 13–45. https://doi.org/10.3897/natureconservation.62.163636

Klusmann C, Brotherton P, Schiller T, Wulf S, Marsden K (2026) Wetlands in the EU policy context. In: Kaden US, Schmid S, Wulf S, Marsden K, Klusmann C, Bonn A, Tockner K, Scholz M (Eds) Wetlands in a Changing Climate: Restoring Coasts and Floodplains. Nature Conservation 62: 317–335. https://doi.org/10.3897/natureconservation.62.163780

Matthews A (2024) What can we learn from the dismantling of GAEC 8? CAP Reform, October 13, 2024. http://capreform.eu/what-can-we-learn-from-the-dismantling-of-gaec-8/

Nadeu E, Godfroy A (2024) Supporting a transition to sustainable farming systems. Reflecting on the CAP implementation and the use of crisis responses. Policy Report. Institute for European Environmental Policy, Brussels. https://ieep.eu/publications/supporting-a-transition-to-sustainable-farming-systems-reflecting-on-the-cap-implementation-and-the-use-of-crisis-responses/

OIEAU [International Office for Water] (2024) European NWRM+ platform. www.nwrm.eu

SDFA (Strategic Dialogue on the Future of EU Agriculture) (2024) Strategic Dialogue on the Future of EU Agriculture: A shared prospect for farming and food in Europe. European Commission, Brussels. https://agriculture.ec.europa.eu/overview-vision-agriculture-food/main-initiatives-strategic-dialogue-future-eu-agriculture_en

Vandermaesen T, Remeta P, Leimane L, Forestier O, Gilissen C, Jeffries B, Morales A, Pullen A (2024) Can your money do better? Redirecting harmful subsidies to foster nature and climate resilience. WWF European Policy Office, Brussels. https://wwfeu.awsassets.panda.org/downloads/wwf---harmful-subsidies-report_full-report.pdf